

REMARKS

By way of the present amendment, claims 1, 2, 4 and 7 have been amended and new claims 21-29 have been added. Applicant respectfully requests reconsideration in view of the following remarks.

Amendments to Claims

Claim 1 has been amended to recite a resonator having a tunable resonance wavelength and formed from electro-optic material. Support for this amendment can be found, for example, on page 3, lines 16-18 and page 4, lines 4-6 of the Specification.

Claim 2 has been amended to recite a separation layer interposing the first and second waveguides and a core layer of the resonator. Support for this amendment can be found, for example, on FIGS. 3A and 3B and page 16, lines 7-21 of the Specification.

Claim 7 has been amended to recite wherein coupling gaps interpose the resonator and the first and second waveguides. Support for this amendment can be found, for example, on FIGS 2A and 2B and page 15, lines 1-7 of the Specification.

New claim 21, which depends from claim 1, adds the limitation of the tunable laser further comprising first and second electrodes formed on opposite sides of the resonator. Support for new claim 21 can be found, for example, on FIG. 3B and page 16, lines 18-21 of the Specification.

New claim 22, which depends from claim 1, adds the limitation wherein each of the first and second waveguides has two ends that are thicker than a central portion thereof. Support for new claim 22 can be found, for example, on page 14, lines 6-12 of the Specification.

New independent claim 23 incorporates limitations from amended claim 1 and new claim 21.

New dependant claims 24-29 are similar to amended claims 2 and 7, original claims 3, 5 and 6 and new claim 23, respectively, except they depend from new claim 23 instead of claim 1.

Claim Rejections under 35 U.S.C. § 112

Claims 1, 2 and 7 were rejected under 35 U.S.C. § 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. Claims 3-6 and 8 were rejected for being dependant on indefinite base claims.

With regard to claim 1, Applicant respectfully traverses. Claim 1 recites “first and second waveguides *optically coupled* to the resonator.” (Emphasis added). This optical coupling enables optical signals to pass between the first and second waveguides and the resonator as required by the invention. Thus, claim 1 clearly specifies the *essential* cooperative relationship between the first and second waveguides and the resonator. Applicant, therefore, respectfully requests that the 112 rejection of claim 1 be withdrawn.

With regard to claims 2 and 7, Applicant has amended claims 2 and 7 to more specifically define vertical and horizontal coupling in terms of the structure of the tunable laser. Specifically, claim 2 has been amended to recite a separation layer vertically coupling the first and second waveguides to the resonator, and claim 7 has been amended to recite coupling gaps horizontally coupling the first and second waveguides to the resonator. Applicant believes that these amendments overcome the 112 rejection of claims 2 and 7.

Claim Rejections under 35 U.S.C. § 102

Claims 1, 2, 7, 19 and 20 were rejected under U.S.C. 102(e) as being anticipated by Grubb et al (6344925). Applicant respectfully traverses.

Claim 1, as amended, is not anticipated by Grubb because Grubb fails to disclose a resonator having a tunable resonance wavelength and formed from electro-optic material. The claimed resonator provides the laser of the invention with wavelength selectivity by tuning its resonance wavelength. In Grubb, by contrast, wavelength selectivity is provided by tunable WDM couplers 46_i and 46_o and tunable reflectors 54_L and 54_H (see column 7, lines 45-49 and column 8, lines 22-34). In addition, Grubb's resonator is made of optical fiber or other Ramen gain medium instead of electro-optic material (see column 7, lines 41-49). Because Grubb does not anticipate claim 1, claim 1 is patentable over Grubb.

Claim 1 is also not rendered obvious by the combined teachings of Grubb and Ho (6009115). Grubb discloses a cascaded Ramen resonator (CRR) comprising input and output WDM couplers 46_i and 46_o and a fiber Ramen ring 48, made of optical fiber or other Ramen gain medium, interconnecting the WDM couplers 46_i and 46_o (see FIG. 6 and column 7, lines 32-49 of Grubb). The fiber ring 48 provides Ramen gain and stoke wavelength shifting, which is essential for the function of a CRR. Ho discloses a semiconductor micro-resonator device 10 comprising a microcavity resonator 12 and a pair of waveguides 14 and 16 (see FIG. 1 and column 3, line 66 to column 4, line 1 of Ho).

Ho's microcavity resonator 12 differs from Grubb's fiber ring 48 in that Ho's microcavity resonator 12 is formed of semiconductor material instead of optical fiber or other Ramen gain medium (see column 4, lines 62-65). Because Ho's microcavity resonator 12 is semiconductor-based, one skilled in the art would not think to replace Grubb's fiber ring 48 with

Ho's microcavity resonator 12 to come up with the tunable laser of claim 1. For one reason, semiconductors have much higher optical loss than Ramen gain fibers. As a result, Ho's microcavity resonator 12 would require a much higher pump power to realize the same Ramen gain as Grubb's fiber ring 48. Another reason is that fiber rings in CCRs are typically required to be meters to kilometers in diameter in order to achieve enough Ramen gain. Realizing such a large diameter with a semiconductor-based resonator, such as Ho's microcavity resonator 12, is not feasible.

Because claim 1 is not rendered obvious by the combined teachings of Grubb and Ho, claim 1 is patentable over their combination.

Claims 2, 7, 19 and 20 all depend from claim 1 and are therefore patentable for at least the reasons given above for claim 1.

Claim Rejections under 35 U.S.C. § 103

Claims 3-6 and 9-18 were rejected under 35 U.S.C. 103(a) as being unpatentable over Grubb et al. (6344925) in view of Ho (6009115). Applicant respectfully traverses.

Claims 3-6 and 9-18 all depend from claim 1 and are therefore patentable for at least the reasons given above for claim 1.

Patentability of New Claims

New claims 21 and 22 depend from amended claim 1, and are therefore patentable for at least the reasons given for claim 1 above.

New independent claim 23 recites a resonator formed from electro-optic material and first and second electrodes formed on opposite sides of the resonator. New claim 23 is patentable for similar reasons given above for amended claim 1.

New claims 24-29 depend from new independent claim 23 and are therefore patentable for the reason given for new claim 23.

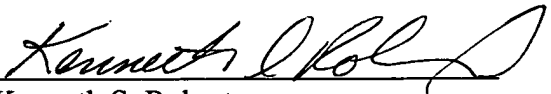
Conclusion

It is believed that the Application is now in condition for allowance and a favorable action is respectfully solicited.

Respectfully submitted,

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